

June 1997 Curriculum Vitae for: GARY DEAN DOOLEN

EDUCATION

Purdue University, B.S. in Engineering Science "with highest distinction," 1961

Purdue University, M.S. in Physics, 1964

Purdue University, Ph.D. in Physics August, 1967

National Science Foundation Fellowship, 1961-1967

EMPLOYMENT

National Academy of Science/National Research Council- Research Associate at Goddard Space Flight Center, 1967-1969

Texas A&M University - Department of Physics, 1969-1975

At Los Alamos National Laboratory since 1975, Gary Doolen has worked on a wide range of research: fluid dynamics, nuclear physics, atomic physics, plasma physics, magnetohydrodynamics, neural networks, nanotechnology, lattice gas and lattice Boltzmann methods, and nonlinear mathematics. He served as Senior Scientific Editor for the *Defense Research Review* for two years. He was Deputy Director for the Center for Nonlinear Studies for 1989 and 1990. He was Acting Director for the Center for 1991-1994. Since 1994, he has been the Complex Systems Group Leader in the Theoretical Division at Los Alamos. In 1996 and 1997, he served as Project Leader for Accelerator Driven Transmutation Technology.

BOOKS EDITED

1. "Transport and Propagation in Nonlinear Systems," Journal of Statistical Physics, Volume **39** (1985).
2. "Large Nonlinear Systems," Complex Systems, Volume **1**(4) (1987).
3. "Advances in Fluid Turbulence," Physica, Volume **D37** (1989).
4. "Lattice Gas Methods for Partial Differential Equations," Santa Fe Institute Studies in the Sciences of Complexity, Addison-Wesley, (1990).
5. "Lattice Gas Methods for PDEs: Theory, Applications and Hardware," Physica**D47**, January (1991).

PROFESSIONAL SOCIETIES

American Physical Society – Divisions of Atomic, Molecular and Optical Physics, Biological Physics, Chemical Physics, Computational Physics, Fluid Dynamics, Nuclear Physics, and Plasma Physics

APS Div. of Computational Physics, Secretary/Treasurer 1993-1995

APS Div. of Computational Physics, Chair/Vice-Chair 1997-1999

Society for Industrial and Applied Mathematics

American Nuclear Society

AWARDS

RD-100 Award, 1988, For the Development of the Lattice Gas Algorithm

1993 Los Alamos National Laboratory Distinguished Performance Award

RD-100 Award, 1993, For the Development of the Lattice Boltzmann Permeameter

PUBLISHED PAPERS

1. A. Tubis, T. Kanki, and G. Doolen; "*Nucleon as a Composite Particle*," Phys. Rev. **142**: 1082-1085 (1966).
2. A. Tubis, T. Kanki, and G. Doolen; "*Self-Consistent Determination of the Position and Width of the $33-N^*$ Resonance*," Phys. Rev. **142**: 1072-1081 (1966).
3. G. Doolen; "*Maximum Number of Binary Collisions for Three Point Particles*," Phys. Rev. **166**: 1651-4 (1968).
4. G. Doolen; "*Maximum Number of Binary Collisions for Three Relativistic Point Particles*," Phys. Rev. **176**: 1541-1543 (1968).
5. G. Doolen; "*The Faddeev Equations Using Two-Body T-Matrices with a P-Wave Resonance*," in Three Particle Scattering in Quantum Mechanics, J. Nuttall, Ed. (Benjamin, New York, 1968).
6. G. Doolen, G. McCarter, F.A. McDonald, and J. Nuttall; "*S-Wave Elastic Positron-Hydrogen Scattering in the Ionization Region*," Phys. Rev. **A4**: 108-111 (1971).
7. G. Doolen and J. Nuttall; "*Asymptotic Form of the Wavefunction for Neutral-Particle Hydrogen Atom Scattering*," J. of Mathematical Physics **12**: 2198 (1971).
8. M. B. Hidalgo, J. H. McGuire, and G. D. Doolen; "*Glauber Calculation of Electron-Hydrogen Ionization Cross Sections*," J. Physics B: Atomic Molec. Physics **5**: L70-72 (1972).
9. J. H. McGuire, M. B. Hidalgo, G. D. Doolen, and J. Nuttall; "*Glauber Theory of Atomic Hydrogen Ionization by Electron Impact*," Phys. Rev **A7**: 973-979 (1973).
10. M. Jain and G. Doolen; "*Exact $N - 2$ H Break-Up Calculations*," Phys. Rev. **C8**: 124-129 (1973).
11. G. Doolen, M. Hidalgo, J. Nuttall, and R. Stagat; "*Complex Rotations in Atomic Scattering Theory*," in Atomic Physics **3**: 257-260 (Plenum, New York, 1973).
12. G. D. Doolen, J. H. McGuire, and M. H. Mittleman; "*High Energy K-Shell Ionization by Heavy Particles*," Phys. Rev. **A7**: 1800-1803 (1973).
13. G. D. Doolen, and W. D. Robb; "*Electron-Atom Born Ionization*," in Electronic and Atomic Collisions, B. C. Cobic and M. V. Kurepa, Eds., Proc. Int. Conf. on Physics of Electronic and Atomic Collisions, Vol. I. p. 391, Belgrade (1973).
14. G. Doolen, M. Jain, and T. Burnett; "*Behavior of the Three Nucleon System When the Two Nucleon Interaction is Varied*," Phys. Rev. **C9**: 23-37 (1973).
15. S. B. Raju and G. D. Doolen; "*Scattering of Three Charged Particles in One Dimension*," Phys. Rev. **A9**: 1965-1968 (1974).
16. P. L. Ball, G. D. Doolen, E. Fry, and M. Wedin; "*A Car-Crash Experiment for the Undergraduate Laboratory*," Physics Teacher **42**: 645-648 (1974).
17. G. Doolen, J. Nuttall, and R. W. Stagat; "*Electron-Hydrogen Resonance Calculation by the Coordinate Rotation Method*," Phys. Rev. **A10**: 1612-1615 (1974).

- 18.** G. Doolen; “*Procedure for Calculating Resonance Eigenvalues*,” Journal of Physics B: Atomic and Molecular Physics **8**: 525-528 (1975).
- 19.** T. Burnett, G. Doolen, S. Rountree, and W. Derek Robb; “*Differential Cross Sections for Electron Impact Ionization of Helium*,” Phys. Rev. **A13**: 626-631 (1976).
- 20.** P. Lambropoulos, G. Doolen, and S. P. Rountree; “*Electric Quadrupole Transitions in Multiphoton Ionization*,” Phys. Rev. Lett. **34**: 636-639 (1975).
- 21.** G. Doolen; “*Atomic Resonances Above the Total Ionization Energy*,” Phys. Rev. **A12**: 1121-1123 (1975).
- 22.** W. Derek Robb, M. Meadows, T. Burnett, and G. Doolen; “*R-Matrix Calculation of Third-Order Optical Harmonic Coefficients of Atomic Hydrogen and Helium*,” Phys. Rev. **A15**: 1063-1067 (1977).
- 23.** G. D. Doolen, J. Nuttall, and C. J. Wherry; “*Evidence for a Resonance in $e^+ - H$ S-Wave Scattering*,” Phys. Rev. Lett. **40**: 313-315 (1978).
- 24.** G. Doolen; “*Complex Scaling: An Analytical Model and Some New Results for $e^+ - H$ Resonances*,” Int. Journal of Quantum Chemistry **XIV**: 523-528 (1978).
- 25.** G. D. Doolen; “*Nuclear Excitation Rate*,” Phys. Rev. Lett. **40**: 1695-1698 (1978).
- 26.** G. D. Doolen; “*Nuclear Excitation Rate for Low-Lying Excited States in ^{237}U and ^{238}U* ,” Phys. Rev. **C18**: 2547-2559 (November 1978).
- 27.** W. L. Slattery, G. D. Doolen, and H. E. DeWitt; “*Improved Equation of State for the Classical One-Component Plasma*,” Phys. Rev. **A21**: 2087-2095 (1980).
- 28.** G. D. Doolen; “*Nuclear Excited States in Weapon Design (U)*,” in Los Alamos National Laboratory Report LA-8765-MS (SRD) (March 1981).
- 29.** W. L. Slattery, G. D. Doolen, and H. E. DeWitt; “*N-Dependence in the Classical One-Component Plasma Monte Carlo Calculations*,” Phys. Rev. **A26**: 2255-2258 (1982).
- 30.** G. D. Doolen, D. F. Dubois, H. A. Rose, and B. Hafizi; “*Coherence in Chaos and Caviton Turbulence*,” Phys. Rev. Lett. **51**: 335-338 (1984).
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- 32.** G. D. Doolen, D. F. Dubois, and H. A. Rose; “*Nucleation of Cavitons in Strong Langmuir Turbulence*,” Phys. Rev. Lett. **54**: 804-807 (1985).
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- 34.** J. P. Dahlburg, D. Montgomery, G. D. Doolen, and L. Turner; “*Turbulent Relaxation to a Force-Free Field-Reversed State*,” Phys. Rev. Lett. **57**: 428-431 (1986).
- 35.** J. P. Dahlburg, D. Montgomery, G. D. Doolen, and W. H. Matthaeus; “*Large-scale Disruptions in a Current-carrying Magnetofluid*,” J. of Plasma Physics **35**: 1-42 (1986).

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- 40.** G. Doolen and D. A. Liberman; “*Calculations of Photoabsorption by Atoms Using a Linear Response Method*,” *Physica Scripta* **36**: 77-79 (1987).
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- 45.** G. D. Doolen and John Hendricks; “*Monte Carlo at Work*,” Special Issue Los Alamos Science, **15**: 142-143, (1987).
- 46.** R. Y. Dagazian, J. P. Dahlburg, G. Doolen, G. J. Marklin, A. A. Mirin, J. P. Mondt, D. Montgomery, A. G. Sgro, L. Turner, and J. Weiland; “*Evolution, Relaxation and Transport in Spheromaks and Reversed Field Pinches*,” Proc. Eleventh Int. Conf. on Plasma Phys. and Controlled Nucl. Fus. Res., Kyoto, p. 639 (1987).
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- 48.** H. Chen, S. Chen, Gary Doolen, and Y. C. Lee; “*Simple Lattice Gas Models for Waves*,” *Complex Systems* **2**: 259-267 (1988).
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- 50.** K. G. Eggert, B. J. Travis, Shiyi Chen and Gary D. Doolen; “*Cellular Automata Technique for Multiphase Flow in Porous Media*,” *EOS Trans AGU*, **69**(44), 1193 (Nov. 1988).
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- 55.** K. Diemer, K. Hunt, S. Chen, T. Shimomura and G. D. Doolen; “*Density and Velocity Dependence of Reynolds Numbers for Several Lattice Gas Models*,” Lattice Gas Methods for Partial Differential Equations, SFI, eds. G. Doolen *et al.* 137–178 (1989).
- 56.** M. L. Theobald, D. Montgomery, G. D. Doolen, and J. Dahlburg; “*Sawtooth Oscillations about Helical Current Channels*,” Phys. Fluids **B1**: 766–773 (1989).
- 57.** Gary D. Doolen; “*What Can We Hope for Lattice Gas Methods?*,” in *Whither Turbulence? Turbulence at the Crossroads*; p397–409. Springer, Lecture Notes in Physics, J. Lumley, ed. (1989).
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- 59.** G. D. Doolen; CRC Handbook of Chemistry and Physics, p. 193 (1990).
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- 61.** Shiyi Chen, Hudong Chen, G. D. Doolen, Y. C. Lee, H. Rose and H. Brand; “*Lattice Gas Models for Nonideal Gas Fluids*.” Physica **D47**: 97–111 *Lattice Gas Methods for PDE’s: Theory, Application, and Hardware* (1991).
- 62.** L. S. Luo, H. Chen, S. Chen, G. D. Doolen and Y. C. Lee; “*Generalized Hydrodynamic Transport in Lattice Gas Automata*.” Phys. Rev., Rapid Communications, **A43**: 7097–7100 (1991).
- 63.** Shiyi Chen, G. D. Doolen, K. Eggert, D. Grunau, and E. Y. Loh; “*A Local Lattice Gas Model for Immiscible Fluids*.” Phys. Rev. **A43**: 7053–7056 (1991).
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- 65.** Shiyi Chen, G. D. Doolen, K. Eggert, D. Grunau, and E. Y. Loh; “*Lattice Gas Simulation of One- and Two-Phase Fluid Flows Using the Connection Machine-2*,” Proceedings of Workshop on Discrete Models of Fluid Dynamics, ed. A. S. Alves, p. 232–248 (1991).
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- 67.** Shiyi Chen, Yaosong Chen, and G. D. Doolen; “*Lattice Gas Simulation of Viscous Flow in a Cavity*.” Scientia Sinica **A (4)**: 345 (1990).
- 68.** Hudong Chen, S. Chen, G. D. Doolen, and W. H. Matthaeus; “*A Brief Description of Lattice Gas Models for Multiphase Flows and Magnetohydrodynamics*.” 1989 Lectures in Complex Systems, ed. E. Jen, p. 389 (1990).

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- 71.** Chen, S., Z. Wang, X. Shan, and G. D. Doolen; “*Lattice Boltzmann Computational Fluid Dynamics in Three Dimensions.*” *J. Stat. Phys.* **68**: 379–400 (1992).
- 72.** Chen, S., G. D. Doolen, R. H. Kraichnan and Z. She; “*On Statistical Correlations Between Velocity Increments And Locally- Averaged Dissipation In Homogeneous Turbulence.*” *Physics of Fluids*, **A5**: 458–463 (1993).
- 73.** J. P. Dahlburg, J. H. Gardner, G. D. Doolen and S. W. Haan; “*The Effect Of Shape In The Three-Dimensional Ablative Rayleigh-Taylor Instability: I. Single Mode Perturbations.*” *Physics of Fluids B*, **5**: 571-584 (1993).
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- 75.** B. Travis, K. Eggert, D. Grunau, S. Chen and G. D. Doolen; “*Lattice Boltzmann Models for Flow in Porous Media.*” *Computing at the Leading Edge*, Proceedings of Research in Energy Sciences, p. 42-47 (1992).
- 76.** Shiyi Chen, Gary Doolen, J. R. Herring, Robert H. Kraichnan, Steve A. Orszag and Zhensu She; “*Far-Dissipation Range of Turbulence.*” *Physical Review Letters*, **70**: 3051-3054 (1993).
- 77.** Zhensu She, Shiyi Chen, Gary Doolen, R. H. Kraichnan and Steve Orszag; “*Reynolds Number Dependence Of Isotropic Navier-Stokes Turbulence,*” *Physical Review Letters*, **70**: 3251-3254 (1993).
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- 79.** Shiyi Chen, G. D. Doolen, S. Dawson and D. Janecky; “*Lattice Methods and Their Applications To Reacting Systems,*” *Computers and Chemical Engineering*, **19**: 617-646 (1995).
- 80.** Shuling Hou, J. Sterling, S. Chen and G. D. Doolen; “*A Lattice Boltzmann Subgrid Model for High Reynolds Number Flows,*” AMS Proceedings of Lattice Gas Meeting, Canada, Fields Institute Communications, Vol. 6 p. 151-182 (1996).
- 81.** Shiyi Chen, Gary D. Doolen, Robert H. Kraichnan and Liang-Ping Wang; “*Is the Kolmogorov Refined Similarity Relation Dynamic or Kinematic?,*” *Physical Review Letters*, **74**: 1755-8 (1995).
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- 85.** Shuling Hou, Qisu Zou, S. Chen, G. D. Doolen, and A. C. Cogley; “*Simulation of Cavity Flow by the Lattice Boltzmann Method,*” *J. Computational Physics*, **118**: 329-347, (1995)

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- 87.** Lishi Luo, H. Chen, S. Chen and G. D. Doolen; “*H-Theorems for Discrete Velocity BGK Equations*,” submitted to Journal of Statistical Physics (1994).
- 88.** J. P. Dahlburg, D. E. Fyfe, J. H. Gardner, S. W. Haan, S. E. Bodner, and G. D. Doolen; “*Three-Dimensional Multimode Simulations of the Ablative Rayleigh-Taylor Instability*,” Physics of Plasmas, 2: 2453-2459 (1995).
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- 90.** Q. Zou, S. Hou, and G. D. Doolen; “*Analytical Solutions of the Lattice Boltzmann BGK Model*,” J. Stat. Phys., 81: 319–334 (1995).
- 91.** X. Shan and G. D. Doolen; “*Multicomponent Lattice-Boltzmann Model with Interparticle Interaction*,” J. Stat. Phys., 81: 379–393 (1995).
- 92.** W. Jitschin, R. Stotzel, T. Papp, M. Sarkar and G. D. Doolen; “*Coster-Kroning Yields of the Xe-54 L-subshells Measured Through Synchrotron Photoionization*,” Phys. Rev. A52: 977-983 (1995).
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- 95.** Igor E. Aronov, Gennady P. Berman, David K. Campbell, Gary D. Doolen, and Sergey V. Dudiy; “*On the Crossover of the Surface Plasmon Spectrum from Two-Dimensional to Quasi On-Dimensional in a Quantum Point Contact*,” Accepted in Physica B, (1997).
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- 97.** Xiaoyi He and G. D. Doolen; “*Lattice Boltzmann Method On Curvilinear Coordinates System: Flow Around A Circular Cylinder*,” J. Comp. Phys. 134: 306-315 (1997).
- 98.** Xiaoyi He and G. D. Doolen; “*Lattice Boltzmann Method On Curvilinear Coordinates System: Vortex Shedding Behind A Circular Cylinder*,” Phys. Rev. E56: 434–440 (1997).
- 99.** Nianzheng Cao, Shiyi Chen, and Gary D. Doolen ; “*Statistics and Structures of Pressure in Isotropic Turbulence*,” Physics of Fluids, (submitted 1997).
- 100.** X. He, X. Shan, and G. D. Doolen ; “*A Discrete Boltzmann Equation Model for Non-ideal Gases*,” Phys. Rev. E, (submitted 1997).
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